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Digital Creativity: Computational Thinking Workshops With Primary Teachers

Abstract

This paper will give an overview of the progress of the Digital Creativity project that has been rolled out in Scotland by Computing At School Scotland. Local professional learning hubs were established in Edinburgh to train and support Primary school teachers to teach Computing Science (CS) lessons to their classes.

Themes were selected each term (sequencing, iteration and selection). Each term there were two meetings on one of the topics. The first meeting looked at the topic using “unplugged” activities and the second meeting allowed teachers to learn about the topic using Scratch or other similar drag and drop programming environments.

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Author Keywords

Computational thinking; Teachers; Education; Professional Learning, Professional Development, Scratch; Schools, Programming, Unplugged computing.

ACM Classification Keywords

K.3 Computers and education: *K.3.0* General, *K.3.2* Computer science education, *K.3.2* Curriculum

Introduction

This paper will give an overview of the progress of the Digital Creativity project that has been rolled out in Scotland by Kate Farrell, a secondary Computing teacher currently seconded to Computing At School Scotland. It will look at the local professional learning hubs established in Edinburgh to train and support Primary school teachers to teach Computing Science (CS) lessons to their classes.

CS is part of the Primary curriculum in Scotland currently but due to problems with the curricular outcomes, lack of professional learning opportunities or resources, and inexperienced teachers, CS is often not covered well.

Workshop Themes

“Sequencing: We sequence things by arranging them in a particular order. Computers work by following a precise set of instructions.

Loops: When a sequence of instructions in a computer program is repeated, this is called an iteration. In a computer program, a common form of iteration is a loop, which repeats code a number of times

Selection: In computing selections are decisions or questions. At certain steps of a program there may be more than one way to proceed – so a decision needs to be made.”

Description of themes from email to participating teachers, Kate Farrell, October 2015

Digital Creativity and Computational Thinking

The Digital Creativity project was started by Nesta in 2013-14. During the first year it focused on one day professional learning events and in-school one-to-one support for teachers in the areas of digital making, ICT and Computing Science (CS).

In 2014 Nesta funded Computing At School Scotland to continue the project for an additional year, this time looking at establishing professional learning ‘hubs’ for teachers to meet up and learn together with a small group of teachers from their local area. It was hoped that this would give the benefit of personalised training and support of the one-to-one model but in a more scalable and cost-effective way.

Most of the work in 2014-15 has focused in from the wider ‘field’ of digital creativity to narrow in on Computing Science and Computational Thinking skills. This was felt to be the area of digital creativity where Primary teachers need the most assistance. It is a subject that would be hugely difficult for a Primary teacher with no knowledge to learn the skills and concepts on their own. The key aim throughout has been to teach these concepts in a creative and fun way so that teachers can see how it applies to other subject areas and how easily it can be implemented in their class.

Hubs

Hubs have been trialled in three Scottish cities: Edinburgh, Glasgow and Dundee. This paper will focus on the Edinburgh hubs as they are the most established of the three cities.

Currently there are four hubs in Edinburgh that have met regularly. The hubs are run by Kate Farrell with assistance from secondary CS teachers in each of the local areas. The hubs are also supported and promoted by staff in the local authority as well as the two CS Lead Teachers for the local authority.

It was decided that the hub meetings would focus on basics of computational thinking as this was the area most crucially lacking in Primary Schools of all the areas covered within Digital Creativity.

After running an introductory workshop in the four hubs all attendees were consulted about future topics. Following discussions with the two CS Lead Teachers, it was decided to focus on three topics of computational thinking, one each term. These were algorithms and sequences; loops and iteration; and decision making and conditional statements. These were selected in order to focus on core CS concepts to try and avoid the meetings being just about application training.

Each term there were two meetings per hub on these topics, one with an “unplugged” approach of practical activities without computers and the second meeting using Scratch on computers or Pyonkee (a scratch clone) on iPads, depending on the teacher’s preference.

The first term on algorithms (October to December 2014) covered the basics of how computer programs work (a set of logical instructions that the computer

follows) and activities on how to use a block based programming environment like Scratch.

27-30th October 2014: **Sequencing unplugged** - learning about describing a solution to a problem as a list of precise instructions. We will cover class activities that don't require computers

24-27th November 2014: **Sequencing with PCs and iPads** - learning simple programming skills using drag and drop based programming (Scratch and Pyonkee)

The second term (January to April 2015) looked at iterations and loops through creating animations with characters (or 'sprites') looping simple movements to create more sophisticated animations.

26-29th January 2015: **Loops unplugged** - learn about loops and iteration with fun practical activities (no computers required)

2-5th March 2015: **Animate with Loops using PCs and iPads** - Learn about loops and iteration through making computer animations (using Scratch and Pyonkee)

The third term (May to June 2015) will look at decision making structures through making games in Scratch or Pyonkee. Although this concept would normally be covered before iteration, in Scratch it is much easier to create animations than games due to the more complex scripts required for Scratch games.

11-14th May 2015: **Selection unplugged** - Learning about choices and decisions making in Computing without needing computers.

1-4th June 2015: **Make computer games with selection using PCs and iPads** - learn about choices and decision making by creating simple computer games using drag and drop based programming (Scratch and Pyonkee)

Generally there were between 8-10 teachers attending each meetings. The meetings were attended by lower numbers than we would have liked and there is a recognition that the attendance needs to increase in order to facilitate collaboration and sharing between schools in a cluster. Before each meeting Secondary Computing teachers emailed Primary head teachers in their cluster to encourage them to send participants.

The best attendance was at the South-west Hub which includes the Firrhill cluster who participated in the Nesta Digital Creativity project last year. More teachers in this cluster had heard about the project and the benefits of CS in terms of pupil engagement and inter-disciplinary learning. They were keen to continue their involvement in the project. These teachers were novices though, rather than teachers who had major involvement in ICT or CS particularly in the past.

The meetings were well received by the teachers. Those who attended were enthusiastic and express a desire to try out the activities in their class.

The teachers were sometimes given 'homework' tasks to carry out between sessions. It was hoped that this would encourage the teachers to try out Scratch

programming themselves and gain confidence. Teachers at all of the hubs reported that they had tried the activities in class, although some of the teachers trying Scratch for the first time were waiting until they had completed the series of meetings.

Most of the activities were collated from a number of sources on a thematic basis rather than being developed for the hub meetings. The activities for the unplugged loops sessions had to be developed as resources could not be sourced. All of the activities in the sessions were accompanied by lesson plans or teaching resources. Resources were sent electronically after the meetings as well as the paper copy that they received in person so that they can make a class set if they wish. Implementing activities in class is discussed during the sessions as well as practical classroom management strategies.

Another positive development from the Edinburgh Hub meetings is that secondary Computing teachers were working and communicating more with Primary teachers in their clusters. At the meetings there have been offers of support, allowing Primary classes to use High School computer classrooms, and send down sixth year pupils to support Primary teachers delivering Scratch sessions. It is hoped that these support mechanisms will provide some sustainability of the work of the Hubs. If Primary teachers have support and encouragement to deliver that activities they have tried out in the Hub meetings then they are far more likely to continue.